

JOURNAL
OF THE
Bombay Natural History Society.

DECEMBER 1937.

VOL. XXXIX.

No. 4

THE GAME FISHES OF INDIA¹.

BY

SUNDER LAL HORA, D.SC., F.R.S.E., F.L.S., F.Z.S., F.R.A.S.B., F.N.I.,

Assistant Superintendent, Zoological Survey of India, Calcutta.

(With one plate and nine text-figures).

Continued from page 446 of Vol. xxxix.

III.—'GARUA BĀCHCHĀ OR GAURCHCHĀ'.

CLUPISOMA GARUA (HAMILTON) and two allied species.

CONTENTS.

	PAGE
Introduction	659
Nomenclature and Systematic Position	661
Synonymy and Description	666
Bionomics, and Fishing Notes	670
Description of two new species	671
Acknowledgments	677
List of References	677
Explanation of Plate	678

INTRODUCTION.

In the last article (21)² reference was made to the fact that among anglers two Indian catfishes go by the name of *Bāchchā*—*Eutropichthys vacha* (Ham.) and *Clupisoma garua* (Ham.). Both the forms belong to the family *Schilbeidae* and are superficially

¹ Published with permission of the Director, Zoological Survey of India.

² Numerals in thick type within brackets refer to the serial numbers of the various publications listed in the bibliography at the end of the paper.

JAN 31 1938

very much alike. In my treatment of the true *Bāchchā*, I gave the distinguishing features of the two species and a reference was made to their habits and habitats. In the present article it is proposed to give a full scientific account of *Garua Bāchchā* or *Gaurchchā* and of its allied forms.

In the case of *E. vacha* it was shown that specimens of the species from Siam and Burma differed from Indian examples in proportions, etc., to a marked degree, but for want of sufficient material it was not possible to separate them into a distinct species. Similar differences have been observed in the case of the Burmese examples of *Clupisoma garua* (Ham.) and besides it has been found that in the specimens from Burma the entire abdominal edge is sharp and keeled. It has, therefore, been considered advisable to separate them into a new species which is described below (*vide infra* p. 671). To create a new genus on the nature of the abdominal edge would have rather confused the true relationships of the two forms. In this connection attention may be directed to the fact that in the species of *Rohtee* Sykes two similar types of abdominal edges are found (14), and it is remarkable that *R. belangeri* (Cuv. & Val.), in which the abdominal edge is keeled throughout, is essentially a Burmese species. Further it may also be noted that a species of *Pangasius* from Siam, *P. cultratus* Smith, is provided with 'a fleshy keel on the belly, extending from below the pectorals to the vent'. Fowler (11) has established a new genus *Pteropangasius* for its reception on this character alone. In all the three instances noted above it is remarkable that the forms with the keeled abdomen are found towards the east whence, according to my belief, the aquatic fauna migrated and spread towards the west (19). Further the keeled condition of the abdomen is probably a primitive feature, in so far as it is characteristic of the majority of the Isospondylous fishes and of the primitive Cyprinoids (subfamily: Abramidinae).

In the Eastern Himalayas, Messrs. G. E. Shaw and E. O. Shebbear found another species in which the abdominal edge is rounded throughout, the barbels are considerably shorter, the air-bladder is greatly reduced, and there are certain differences in proportions from *C. garua* and the form found in Burma. Here again, though according to some authorities it may be desirable to separate it into a new genus I have considered it advisable for the time being, in view of the paucity of the material and of our very limited knowledge of these forms, to retain it in the genus *Clupisoma* and to describe it as a new species (*vide infra*, p. 673). Thus the three species here included in *Clupisoma* represent three very distinct types and in my opinion form an evolutionary series in which the Burmese form is probably the most primitive and the Eastern Himalayan form the most highly specialised in certain respects, and primitive in certain other respects.

As the colouration undergoes rapid changes when a fish is taken out of water, it is usually difficult to form a correct idea of the natural colours of large fishes; the so-called coloured drawings of such species can at best represent the colours of fresh

specimens. My drawings of the 'Indian Trout' (*Barilius bola* Ham. 20) and of *Vacha* [*Eutropiichthys vacha* (Ham.) 21] are no exception in this respect. In the drawings of *Garua Bāchchā* reproduced here an attempt has been made to show the changes in colouration undergone by the fish when taken out of water. The topmost drawing represents the colouration of the specimen immediately after its removal from water, the middle figure shows the fish after it had been out of water for about one hour and the bottom figure shows the colour after about two hours of the removal of the fish from the water. Gradually a uniform neutral tint begins to predominate and the colour becomes similar to that shown in my drawing of *Eutropiichthys vacha* (21). For all practical purposes, anglers are concerned with the colouration of the fresh specimens and not of the living fish and from this point of view the illustrations already reproduced or to be reproduced in connection with the articles to follow will be found useful. Efforts will, however, be made to describe the colouration of living specimens wherever possible. It may further be indicated that colour is liable to change with the surroundings, so in the case of fishes, at any rate, it does not form a reliable character for distinguishing species.

NOMENCLATURE AND SYSTEMATIC POSITION.

The *Garua Bāchchā* or *Gaurchchā* was discovered for science by Hamilton (13), who named it *Silurus garua*. His interpretation of the genus *Silurus* Linn. seems to have been very vague, as, according to the modern standards, none of his species of *Silurus* is now referred to that genus. In Indian waters there are only two species of *Silurus* (17), *S. wynaadensis* Day and *S. cochinchinensis* Cuv. & Val. The following table shows the present-day systematic position of Hamilton's species of *Silurus*:—

Genus *Heteropneustes* Müller (16).

1. *Silurus singio* Hamilton [= *Heteropneustes fossilis* (Bl.)].

Genus *Callichrous* Hamilton (18).

2. *Silurus pabda* Hamilton [= *Callichrous bimaculatus* (Bl.)].
3. *Silurus canio* Hamilton [= *Callichrous bimaculatus* (Bl.)].
4. *Silurus duda* Hamilton [= *Callichrous bimaculatus* (Bl.)].
5. *Silurus chechra* Hamilton [= *Callichrous bimaculatus* (Bl.)].
6. *Silurus pabo* Hamilton (*Callichrous pabo* Ham.).

Genus *Wallago* Bleeker (15).

7. *Silurus boalis* Hamilton. [= *Wallago attu* (Bl.)].

Genus *Clupisoma* Swainson (22).

8. *Silurus garua* Hamilton. [*Clupisoma garua* (Ham.)].

In the first seven species, the dorsal fin is not provided with a bony, pungent spine and in this respect they agree with the typical members of the genus *Silurus*. In Hamilton's *S. garua* the first ray of the back fin 'is a prickle, indented behind, and terminated by a substance like whale bone' (13, p. 187). On this character, among others, *Gaurchchā* is to be regarded a member of the same family, *Schilbeidae*, as the true *vacha* described in the earlier article (21).

Swainson (22) was the first to separate *Garua* from Hamilton's other allied species and constitute for it a separate genus *Clupisoma* which he defined as follows:—

'Herring-shaped; head and body compressed, of nearly equal breadth; eyes very large; teeth in both jaws and on the palate granulated and crowded; caudal fin large, forked; dorsal fin placed almost above the pectoral; vent nearly central.'

Swainson had no specimen of the species for examination but based his diagnosis of *Clupisoma* on Hamilton's description and figures of *Silurus garua*. At the same time, he proposed a new specific name—*argentata*—for this species. Cuvier and Valenciennes (6), Bleeker (1) and Blyth (4), however, assigned Hamilton's species to *Schilbe* Cuvier, an African genus closely allied to the Indian representatives of the family *Schilbeidae*. In the African genera of the family, however, the two pairs of mandibular barbels are situated at different levels, while in the Indian fishes they are placed in a single row. In 1858, Bleeker (2) separated the Indian species generically from the allied African forms and placed Hamilton's *Silurus garua* into a new genus, *Schilbeichthys*, which was briefly characterised as follows:—

'Pinna dorsalis hymenophora sinifera. Cirri 8. Dentes vomero-palatini in thurmus 4 dispositi.'

At the time of creating this genus Bleeker seems to have been aware of Swainson's *Clupisoma*, for he included *C. argentata* Swainson under the synonymy of his *Schilbeichthys garua*. Later, Bleeker (3) recognised Swainson's genus and merged his *Schilbeichthys* into its synonymy. The genus was included in the family *Siluriformes* and defined as:

'Dentes vomero-palatini in vittam quadripartitam dispositi. Nares magnae palatae approximatae, anteriores non tubulatae. Maxilla inferior superiore brevior. B.7. D.17. P. 1/11. V.1/5.'

Evidently not being aware of *Clupisoma* Swainson, Günther (12) adopted the generic name *Schilbeichthys* and emended its definition as follows:

'One short dorsal fin with a pungent spine; no adipose fin; the anal fin terminates at some distance from the caudal, which is forked. Barbels eight, as in *Ailia*. Vomerine and palatine teeth present. Nostrils close together, at the end of the snout, very wide, the posterior twice as wide as the anterior. Head covered with skin. The upper profile is nearly straight; neck not elevated; upper jaw longer than the lower; orbit with a broad anterior and posterior adipose eyelid, behind the cleft of the mouth. Ventral composed of six rays.'

Only one species—*Sch. garua*—was included by Günther in this genus.

Day (7) disagreed with all previous workers and assigned Hamilton's *garua* to *Pseudeutropius* Bleeker. In doing so he remarked:

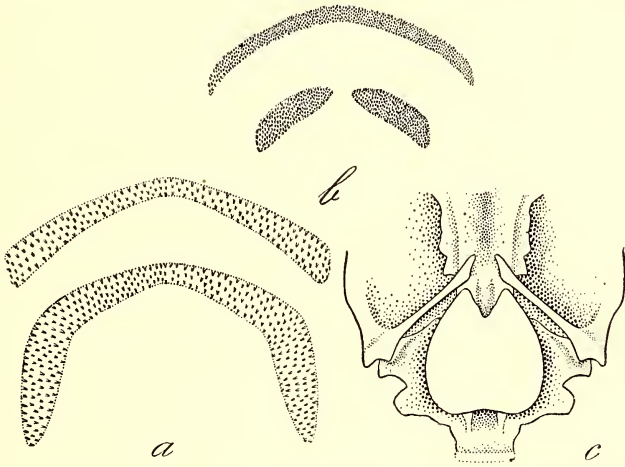
'This species forms the type of the genus *Schilbeichthys*, Bleeker, which differs from the *Pseudeutropius* chiefly in having no second or adipose dorsal fin.

'I have taken a large number of the young of this species from 4 to 9 inches in length, and find that the adipose dorsal, though small, is distinct in the fry; but as the size of the specimens increases up to 6 or 7 inches it has either almost or entirely disappeared, and is invariably absent in the adult.'

'I therefore consider the species to be a *Pseudeutropius*; for the difference which exists in the nostrils between it and some others of the genus is insufficient for more than a specific division.'

The above case for the inclusion of Hamilton's *Silurus garua* in *Pseudeutropius* is not based on any sound reasoning as will be shown in a subsequent communication elsewhere. It is, however, true that the adipose fin is present in the fry of *garua* and is gradually absorbed as the fish grows older. In his original diagnosis of *Schilbeichthys* (*vide supra*, p. 662), Bleeker referred to dentition as the most important character for the definition of his genus, but later he took into consideration the character of the nostrils also. These features, coupled with the herring-like form of the fish and the peculiar form and structure of the air-bladder, are sufficiently distinctive to separate Hamilton's *garua* generically from the allied forms included by Day under *Pseudeutropius* Bleeker. It may here be mentioned that Day's *Pseudeutropius* is a composite genus.

In *Clupisoma garua*, as a rule, the vomero-palatine teeth form a broad, semilunar band (text-fig. 1a) which may sometimes be interrupted in the middle. There is a specimen in the Indian Museum from Assam (No. 468; text-fig. 1b) in which the dentition is abnormal; the vomero-palatine bands are interrupted in the middle and lie obliquely across the palate. The palatine



Text-fig. 1.—Upper dentition and air-bladder of *Clupisoma garua* (Ham.).

- a. Normal dentition of a specimen, 246 mm. in length without caudal. $\times 2\frac{2}{3}$; b. Abnormal dentition of the specimen No. 468, 126 mm. in length without caudal. $\times 4\frac{2}{3}$; c. Air-bladder of a young specimen, 95 mm. in length without caudal. $\times 3\frac{2}{3}$.

teeth are not produced backwards to form a semilunar band, as is usually the case in this species.

The structure of the air-bladder was at first described by Day (8) who stated that:

'Air-vessel in *P. garua*, H. B., small and somewhat heart-shaped, it is closely attached to the bodies of the anterior vertebrae; its external fibrous

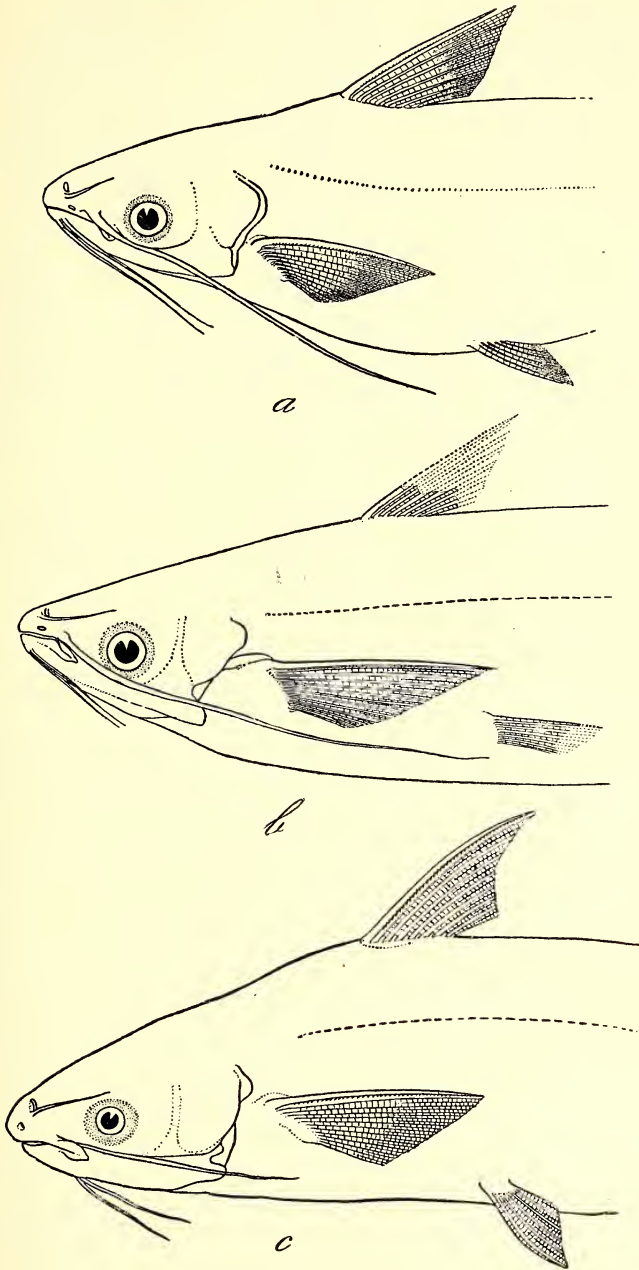
covering is of moderate length . . . *P. garua*, in which the adipose dorsal is so small, and altogether absorbed in the adult, has the smallest air-vessel amongst the larger species which I have examined.'

Bridge and Haddon (5) have, however, described the structure in much greater detail and I have figured it here (text-fig. 1c) to show its form in a young specimen 95 mm. in length without the caudal. With growth the bladder becomes more solid and is still further reduced, but its form remains more or less the same.

In the other two species similar variations of the tooth-bands and of the air-bladder are found. These are discussed below under the accounts of the new species.

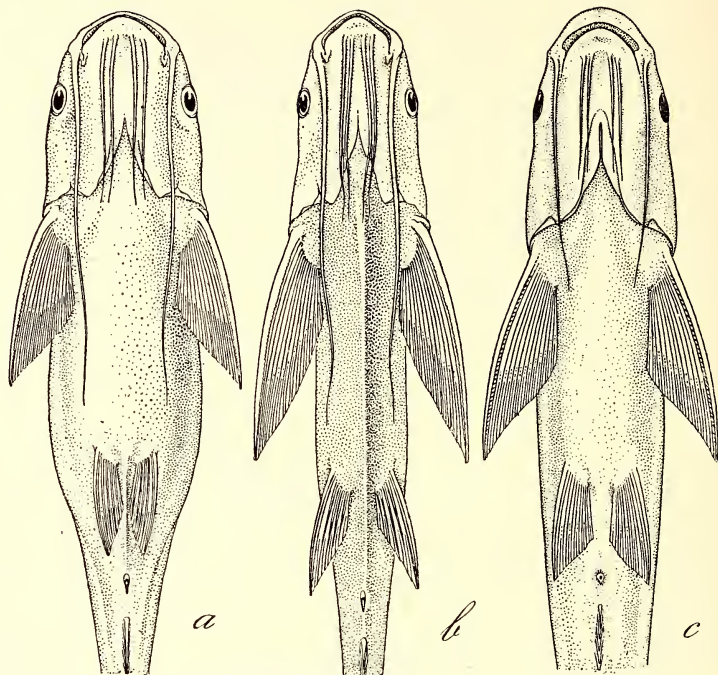
From the above it is clear that the chief diagnostic features of the genus *Clupisoma* are (i) the form of the body, (ii) the nature of the tooth-bands, (iii) the form and nature of the air-bladder and (iv) the large size of the posterior nostrils. The genus may now be redefined as follows:—

The body is elongated and compressed; it is almost herring-shaped. The whole of the abdominal edge or the part between the pelvic fins and the vent may be keeled. The head and body are covered with soft skin. The head is oval, blunt and of moderate size. A median fontanel on head extends between the eyes to the nostrils. The occipital process is narrow and long; it extends almost to the basal bone of the dorsal fin. The eyes are large, ventro-lateral in position and provided with broad adipose lids; these lids are better developed along the anterior and posterior borders of the eye. The eyes are situated behind the cleft of the mouth. The mouth is subterminal, transverse and of moderate width; it is slightly overhung by the snout. The nostrils are very prominent and are not situated very far apart. The anterior nostrils are oval and are placed along the front border of the snout. The posterior nostrils are represented by wide, transverse slits on the top of the head. There are eight barbels, one pair nasal, one pair maxillary with anterior ends situated in grooves below the eyes and two pairs mandibular with their bases not very far from the tip of the lower jaw and forming a straight line. The teeth are small and villiform; they form bands in the jaws which are not produced at the sides. The vomerine and palatine teeth are contiguous, forming either a transverse or a semilunar band across the palate. The tooth-bands on the palate are subject to considerable variations. The dorsal fin is situated considerably in advance of the ventrals; it is provided with a spine of moderate strength which is finely serrated or roughened internally. A small adipose dorsal may be present or absent. The pectoral spine may be strong, roughened externally and serrated internally, or it may be soft and finely pectinated internally. The pelvics have six rays each. The anal fin is long. The caudal fin is deeply forked. The gill-openings are wide. The gill-membranes are deeply notched; they are united with each other but are free from the isthmus. The air-bladder is greatly reduced, thick-walled and flattened; it is closely applied to the ventral surface of the anterior vertebrae.



Text-fig. 2.—Lateral view of head and anterior part of body of the three species of *Clupisoma* Swainson.

- a.* *Clupisoma garua* (Ham.). $\times \frac{2}{3}$. Length of specimen 212 mm. without caudal; *b.* *Clupisoma prateri*, sp. nov. $\times \frac{2}{3}$. Length of specimen 240 mm. without caudal; *c.* *Clupisoma montana*, sp. nov. $\times \frac{2}{3}$. Length of specimen 241 mm. without caudal.



Text-fig. 3.—Ventral surface of head and anterior part of body of three species of *Clupisoma* Swainson.

- a. *Clupisoma garua* (Ham.). $\times \frac{2}{3}$. Length of specimen 212 mm. without caudal; b. *Clupisoma prateri*, sp. nov. $\times \frac{2}{3}$. Length of specimen 240 mm. without caudal; c. *Clupisoma montana*, sp. nov. $\times \frac{2}{3}$. Length of specimen 241 mm. without caudal.

The three species of *Clupisoma*, referred to above, may be distinguished by the following key:—

- A. Nasal barbels not extending to front margin of eye (text-fig. 2a); abdominal edge keeled between pelvics and vent (text-fig. 3a); pectorals not extending to pelvics (text-figs. 2a and 3a) *C. garua* (Ham.).
- B. Nasal barbels extending considerably beyond front border of eye (text-figs. 2b and c); pectorals reaching base of pelvics (text-figs. 2b, 2c; 3b, 3c).
- I. Abdominal edge keeled throughout (text-fig. 3b); maxillary barbels extending beyond middle of pectorals; mandibular barbels extending to posterior margin of operculum *C. prateri*, sp. nov.
- II. Abdominal edge rounded (text-fig. 3c); maxillary barbels not extending beyond base of pectorals; mandibular barbels not extending to posterior margin of operculum *C. montana*, sp. nov.

SYNONYMY AND DESCRIPTION.

***Clupisoma garua* (Hamilton).**

1822. *Silurus garua*, Hamilton, *Fish. Ganges*, pp. 156, 375, pl. xxi, fig. 50.

1839. *Clupisoma argentata*, Swainson, *Nat. Hist. Fish. etc.*, ii, p. 306.

1839. *Schilbe garua*, Cuvier & Valenciennes, *Hist. Nat. Poiss.*, xiv, p. 379, pl. ccccxiii.

1853. *Schilbe garua*, Bleeker, *Verh. Bat. Gen.*, xxv, pp. 54, 110.
 1858. *Schilbe garua*, Blyth, *Proc. As. Soc. Bengal*, p. 283.
 1858. *Schilbeichthys garua*, Bleeker, *Ichth. Arch. Ind. Prod.*, i, Siluri, p. 256.
 1862. *Clupisoma garua*, Bleeker, *Versl. Akad. Amsterdam*, xiv, p. 393.
 1863. *Clupisoma garua*, Bleeker, *Ned. Tijdschr. Dierk.*, i, p. 114.
 1864. *Schilbeichthys garua*, Günther, *Cat. Fish. Brit. Mus.*, v, p. 57.
 1866. *Pseudeutropius garua*, Day, *Proc. Zool. Soc. London*, p. 307.
 1871. *Pseudeutropius garua*, Day, *Proc. Zool. Soc. London*, p. 709 (Air-bladder).
 1873. *Pseudeutropius garua*, Day, *Rep. Freshw. Fish. Fisheries India & Burma*, p. 265.
 1877. *Schilbeichthys garua*, Beavan, *Freshw. Fish. India*, p. 134.
 1877. *Pseudeutropius garua*, Day (in part), *Fish. India*, p. 474, pl. cix, fig. 6.
 1880. *Pseudeutropius garua*, Day (in part), *Faun. Brit. India Fish.*, i, p. 141.
 1894. *Schilbeichthys garua*, Bridge & Haddon, *Phil. Trans. Roy. Soc. London* (B), clxxxiv, pp. 211-213 (Air-bladder and Weberian Ossicles).
 1913. *Pseudeutropius garua*, Chaudhuri, *Rec. Ind. Mus.*, viii, p. 255.
 1937. *Clupisoma garua*, Hora, *Proc. Nat. Inst. Sci. Ind.*, iii, p. 39 (disposition of liver and kidney).

Vernacular Names:—*Garua*, *Gharuya* and *Gaurchchā* (Calcutta, Lakshimpur and Goalpara); *Kocha* (Tista); *Punia Cathua* (Oorlah); *Puttosi* (Bengal); *Buchua* (Hind.); *Dhon-ga-nu* (Sind); *Buchua*, *Chel-lee* and *Ka-raad* (Punjab); *Bikree* (Oudh).

Clupisoma garua is a herring-shaped fish, tapering very gradually toward both ends. The head is oval, blunt, and of moderate size; it is somewhat wider than the body. The length of the head is contained from 4.8 to 5.6 times in the length without the caudal; its height at the occiput is almost equal to its greatest width and is contained from 1.2 to 1.6 times in its length. The head is proportionately longer and narrower in young specimens. The eyes are large, ventro-lateral in position and situated almost in the middle of the head. The longest axis of the pupil is vertical. The diameter of the eye is contained from 3 to 3.8 times in the length of the head; from 1.2 to 1.6 times in the length of the snout and from 1.1 to 1.8 times in the interorbital width. The head is provided with a median fontanel between the eyes which extends to the nostrils. The occipital process is long and pointed; it is nearly 4 times as long as wide and sometimes extends to the basal bone of the dorsal fin. There are four pairs of barbels; the nasal barbels usually do not extend as far as the anterior border of the eye, the maxillary barbels reach to the base of the pectorals, and the mandibular barbels to the base of the pectorals. In younger specimens the barbels are proportionately longer. The nostrils are very prominent; the posterior nostrils are large oval slits, sometimes three times as broad as the anterior nostrils. The mouth is fairly wide and almost anterior; the snout projects beyond the lower jaw only slightly. The teeth are small and villiform; those on the palate are arranged in a semicircle. Sometimes the vomero-palatine band is indistinctly divided into four patches and very rarely the teeth on the palate are arranged in two short bands disposed in a transverse row.

The dorsal fin is wholly in advance of the ventrals; its spine is rather slender, rugose anteriorly and feebly serrated posteriorly;

it is almost as long as the head behind the nostrils. The adipose dorsal is always absent in the adult, but in young specimens up to about 100 mm. in length it is present as a minute structure. The pectoral spine is somewhat longer and stronger than that of the dorsal fin; it does not extend to the base of the pelvic fins; it is roughened externally but denticulated internally. The ventral fins are situated slightly dorsal to the ventral profile of the body. The abdominal edge between the pelvics and the vent is keeled. The caudal fin is deeply forked; the lower lobe is longer than the upper.

The depth of the body is contained from 4.6 to 5.6 times in the length without the caudal. The head is somewhat broader than the width of the body.

According to Hamilton (13), 'The prevailing colour is silver, with green on the back. The fins are diaphanous, that on the back and the pectorals being dotted and that of the tail being edged with black. The head and shoulders have a golden gloss.'

During the fishing of a large settling tank at the Calcutta Corporation's Water-works at Pulta during August 1937, several specimens of *Clupisoma garua* were obtained. As there was an artist with me, he very kindly noted the changes in colouration and the three illustrations in the colour plate show this point very clearly. When the fish is just taken out of water the dorsal surface is yellowish apple-green and the upper surface of the head is French-green. The side of the head is light orange-buff with a streak of coral red above the eyes. The sides of the body are silvery showing metallic hues. The fins are mostly diaphanous, but the caudal fin is light yellow in colour with a margin of light neutral tint. About an hour afterwards, the colour along the dorsal surface became French-green and the original yellow was still present in a broad, lateral patch one along each side. The side of the head changed to yellow ochre and the streak above the eye to madder-brown. The marking of the caudal fin became somewhat deeper. After about 2 hours the colour changed to a neutral tint and the caudal fin became distinctly yellow. The head developed light neutral tint and with a considerable proportion of the yellow colour. The base of the anal fin turned light lemon-yellow. The caudal fin became raw sienna and its margin turned still deeper. Finally the colour of the fish changed to a silvery neutral tint, just as was figured in the case of *Eutropiichthys vacha* (Ham.) in the second article of this series.

Distribution :—The material of *C. garua* in the collection of the Indian Museum is not sufficient to discuss its distribution. Day (10) stated that the fish is 'Found generally throughout the larger rivers of Sind, India, Assam and Burma'. The Burmese specimens represent a distinct species. It seems probable that the fish does not occur in the Deccan as I have not found any record of the species from that area. Though I recently collected a considerable amount of material from the Hooghly river above Calcutta, there are not many specimens from other localities in India for study. Consequently it is not possible to give an account of the probable variations undergone by the species.

Measurements in millimetres.

	C. P.	Sara Ghat, Bengal	Saran, Bihar	Shantipur, Hooghli River.	Orissa	Shantipur, Hooghli River.	Assam	Calcutta, Hooghli River.	Kancharapara, Hooghli River.
Total length excluding caudal	96.0	97.0	130.0	132.0	166.0	198.0	220.0	273.0	276.0
Length of head	20.0	20.0	25.3	25.0	33.5	35.0	43.0	51.0	53.0
Width of head	12.0	12.5	16.0	17.0	23.0	25.0	29.0	38.0	41.0
Height of head at occiput	9.0	12.5	16.0	18.0	23.0	27.0	33.0	38.0	42.0
Width of body	18.5	11.5	13.5	15.0	16.0	22.0	25.0	28.0	32.0
Height of body	6.0	18.0	25.0	25.0	33.0	40.0	47.0	48.0	59.0
Diameter of eye	7.0	6.5	8.0	8.0	10.0	11.0	13.0	16.0	14.0
Length of snout	7.0	8.0	10.0	10.5	13.0	15.0	16.0	20.0	21.0
Interorbital width	14.0	8.0	11.0	12.0	16.0	18.5	19.0	24.0	26.0
Length of pectoral spine	13.0	15.0	24.5	23.0	33.0	34.5	39.0	50.0	51.0
Length of dorsal spine	6.5	...	...	21.0	29.0	30.0	37.0	41.0	46.0
Length of nasal barbel	33.0	4.0	4.5	6.0	7.0	6.0	11.0	11.0	10.0
Length of maxillary barbel	17.0	46.0	55.5	55.0	69.0	68.0	77.0	107.0	96.0
Length of outer mandibular barbel.	19.0	15.0	23.0	20.0	30.0	25.0	39.0	43.0	38.0
Length of inner mandibular barbel.	8.0	19.0	24.0	24.0	26.0	28.5	42.0	44.0	45.0
Least height of caudal peduncle	...	8.0	11.0	13.0	16.0	16.0	19.0	24.0	27.5
Commencement of dorsal from tip of snout	30.0	31.0	39.0	40.0	55.0	60.0	67.0	82.0	85.0

BIONOMICS AND FISHING NOTES.

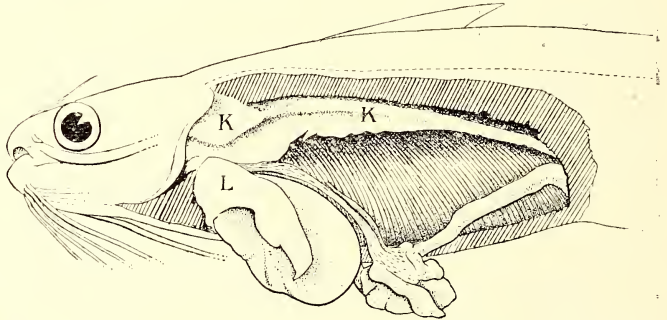
In his list of the fishes of the Rangpur District Hamilton (*vide* Day, 9) made the following observation under *Gharaya*:

'This is a very common fish, but is not eaten by the higher classes, because it is supposed to feed on excrement. It grows to three feet in length, and although its colours are green and silver, has a very lurid ugly appearance.'

In his (13) 'Gangetic Fishes', however, he states:

'The *Garua* is common in the fresh water rivers of the Gangetic provinces, often grows to two feet in length, and by the natives is considered as good eating. It has little or none of that lurid appearance to which many kindred fishes are liable.'

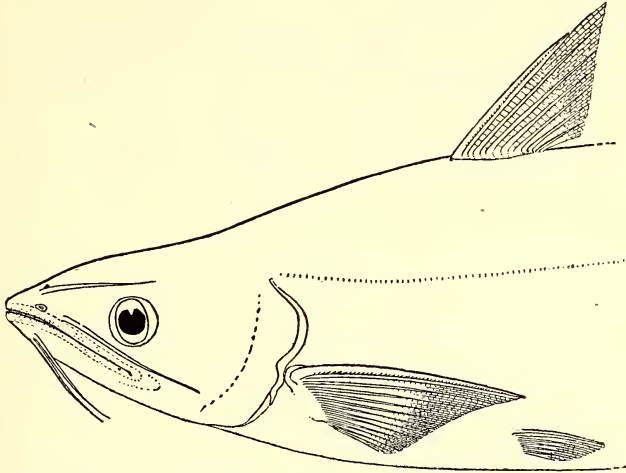
So far as my experience is concerned *Garua Bāchchā* is considered good eating throughout its range. In the Punjab *Bāchchā* is considered a great delicacy by the Indians and Europeans alike and fetches a somewhat higher price. In the course of my recent survey of the Hooghli river above Calcutta I found that both *Eutropiichthys vacha* and *Clupisoma garua* were sold everywhere at a somewhat higher price than the other species of fish.



Text-fig. 4.—Dissection of the visceral organs of *Clupisoma garua* (Ham.), to show the nature of the alimentary canal and the disposition of the liver (L) and the kidney (K). $\times 1\frac{1}{3}$. Reproduced from *Proc. Nat. Inst. Sci. India*, vol. iii, p. 39, 1937).

An examination of the stomach contents of a number of large specimens, over a foot in length, obtained from the Calcutta Corporation's Water-works at Pulta on the 14th August, 1937, showed that the fish feeds on crabs, shrimps, fish, insects, etc. A certain amount of vegetable matter was also found in the stomach of some specimens. The alimentary canal is one and a half times as long as the entire length of the fish and this clearly shows that, as compared with *Eutropiichthys vacha*, it is probably not a very clean feeder. The stomach is in the form of a large bag devoid of any ridges along its walls. As I remarked in the earlier article, probably *Clupisoma* feeds at the bottom whereas *Eutropiichthys* chases its prey in mid-water or at the surface. The nature of the mouth opening in the two forms lends considerable support to such a view.

As anglers in writing their notes have hitherto made no distinction between *Eutropiichthys* and *Clupisoma* I have nothing further to add regarding the fishing of *Garua Bāchchā* beyond



Text-fig. 5.—Lateral view of head and anterior part of body of a specimen, 260 mm. long, of *Eutropiichthys vacha* (Ham.) from the river Hooghli. $\times \frac{3}{4}$.

what has already been given in my earlier account (21). It should, however, now be possible for anglers to make notes on the two species separately for the benefit of sportsmen in general.

DESCRIPTION OF TWO NEW SPECIES.

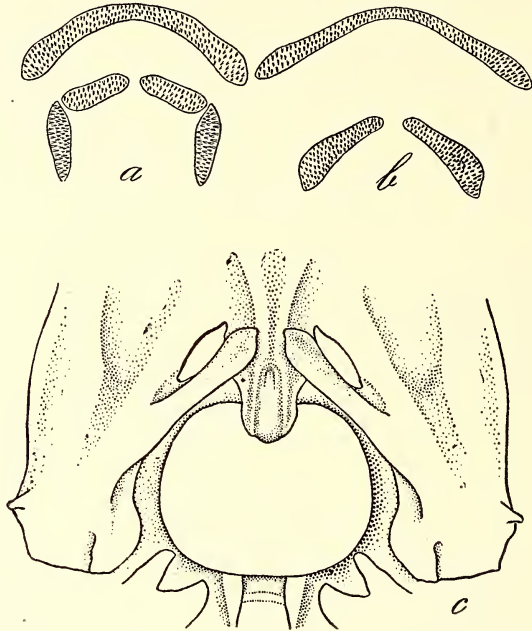
Clupisoma prateri, sp. nov.

1877. *Pseudeutropius garua*, Day (in part), *Fish. India*, p. 474.
 1885. *Pseudeutropius garua*, Vinciguerra (in part), *Ann. Mus. Civ. Stor. Nat. Genova* (2), ii, p. 91.
 1889. *Pseudeutropius garua*, Day (in part), *Faun. Brit. Ind. Fish.*, i, p. 141.
 1890. ? *Pseudeutropius garua*, Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova* (2), ix, p. 209.

Day (10) appears to be the first writer who extended the range of *Clupisoma garua* (Ham.) to Burma without making any comments. Vinciguerra (23) examined one specimen from Burma (Bassein) and one from Calcutta in 1885 and referred both of them to Hamilton's species without noting any points of difference between the two. Later, in his (24) more comprehensive work on the fishes of Burma, he found that his single specimen from Mandalay agreed with his previous example from Bassein and both of them differed from the Calcutta example. He mainly referred to the differences in the length of barbels, pectoral spine, anal fin and in the dentition and was doubtfully of the opinion that the specimens from Burma may not belong to Hamilton's species.

In the old collection of the Indian Museum there are several specimens from Burma referred by Day to *Clupisoma garua*. A careful examination of this material and its comparison with the

typical examples from various parts of India have shown that Vinciguerra's doubts were justified. Though the Burmese examples are not in a very good state of preservation, their main



Text-fig. 6.—Upper dentition and air-bladder of *Clupisoma prateri*, sp. nov.
 a. Upper dentition of specimen, No. 6048, 131 mm. in length without caudal. $\times 3\frac{1}{2}$; b. Upper dentition of type-specimen, Dup. Cat. No. 219, 212 mm. in length without caudal. $\times 3\frac{1}{2}$; c. Air-bladder and associated skeletal elements of the type-specimen. $\times 3\frac{1}{2}$.

features are so distinct from the Indian species that I have no hesitation in proposing for them a new species—*Clupisoma prateri*, and to associate it with the name of Mr. S. H. Prater in slight recognition of the valuable help he has rendered to me from time to time in procuring fresh material of Indian fishes for my studies.

The species will be described in detail when fresh material from Burma becomes available, but for the present I give below in a tabular form the main points of difference between *Clupisoma garua* (Ham.) and *Clupisoma prateri*, sp. nov.

Clupisoma prateri, sp. nov. *Clupisoma garua* (Ham.).

- | | |
|---|--|
| 1. Nasal barbels extend considerably beyond front margin of eye; sometimes even to the posterior border of eye. | Nasal barbels do not reach the eye. |
| 2. Maxillary barbels extend to about the middle of pelvics, and sometimes to the commencement of the anal fin. | Maxillary barbels extend to base of pelvics, or in young to middle of pelvics. |
| 3. Mandibular barbels extend to the hind border of operculum. | Mandibular barbels extend to the base of pectorals. |

Clupisoma prateri, sp. nov. *Clupisoma garua* (Ham.).

- | | |
|--|--|
| 4. Pectorals extend considerably beyond the commencement of pelvics. | Pectorals do not extend to base of pelvics. |
| 5. Anal with about 40 to 44 rays. | Anal with about 32 rays. |
| 6. Whole of dorsal fin considerably in advance of the pelvics. | Whole of the dorsal fin just in advance of the pelvics. |
| 7. Abdominal edge keeled throughout in front of vent. | Abdominal edge keeled between bases of pelvics and vent. |

Besides the differences enumerated above between the two species, the relative proportions of the various parts also differ and these can be made out by a reference to the tables of measurements.

In the young specimens there is a small adipose fin, but it becomes wholly absorbed during growth. The dentition is more or less similar to that described above for *Clupisoma garua* and a similar type of abnormality is found in some of the specimens. Reference may here be made to the fact that in the specimen examined by Vinciguerra the vomero-palatine bands are short and are of the same nature as those illustrated here in text-figure 6b.

Locality: Burma.

Type-specimen: Duplicate Catalogue No. 213, *Zoological Survey of India, Calcutta.*

Measurements in millimetres.

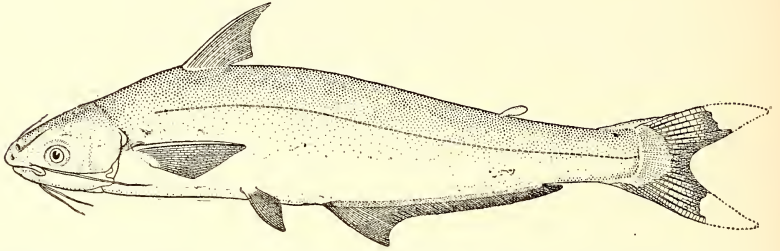
	No. 8765	No. 8709	Dup. Cat. No. 219.
Total length excluding caudal ...	87.0	133.0	231.0
Length of head... ..	17.0	25.0	38.0
Width of head	11.0	15.5	23.5
Height of head at occiput... ..	11.5	17.0	28.0
Width of body	7.0	12.0	18.0
Height of body... ..	15.0	24.5	45.0
Diameter of eye	5.5	7.5	12.5
Length of snout	6.0	10.0	14.0
Interorbital width	8.0	11.0	15.0
Length of pectoral spine	19.0	29.0	50.0
Length of dorsal spine	14.0	...	...
Length of nasal barbel	8.0	12.5	13.5
Length of maxillary barbel	38.0	58.5	87.0
Length of outer mandibular barbel	18.0	22.0	31.0
Length of inner mandibular barbel	19.0	24.0	32.0
Least height of caudal peduncle	6.5	11.0	20.0
Commencement of dorsal from tip of snout	27.0	38.0	64.0

***Clupisoma montana*, sp. nov.**

D. 1/6-7; A.41-43; P.1/12; V.6; C.17.

Clupisoma montana is a graceful species in which the head and body are moderately compressed and the body is relatively less deep. The dorsal profile is slightly arched, being highest near the commencement of the rayed dorsal. The head is short and bluntly

pointed; its length is contained 5 times in the total length without the caudal. The width of the head is contained from 1.5 to 1.6 times and the height at occiput from 1.2 to 1.3 times in its

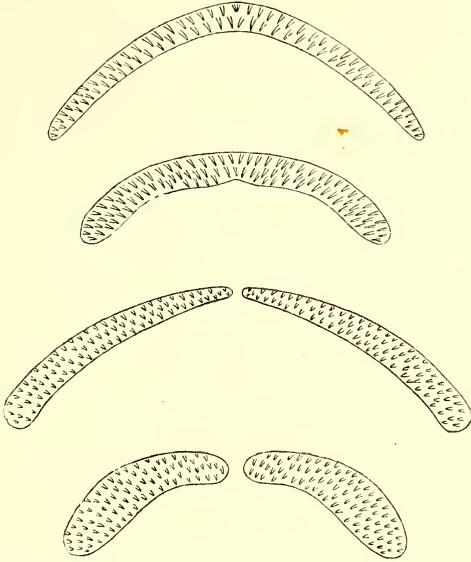


Text-fig. 7.—Lateral view of type-specimen of *Clupisoma montana*, sp. nov. $\times \frac{1}{3}$.

length. In the middle of the dorsal surface of the head there is a narrow groove which commences between the nostrils and the eye and extends over the occipital process. The occipital process is long and narrow and almost meets the basal bone of the dorsal fin. The eyes are situated almost in the middle of the length of the head and are placed laterally above the angle of the mouth; they are provided with broad circular lids. The diameter of the eye is contained about 4.8 times in the length of head, 1.8 times in length of the snout and 2 times in the interorbital width. The interorbital space is distinctly convex. The mouth is inferior and obliquely directed upwards. The lips are thin and adhere closely to the jaws, except at the angles of the mouth where they form free lobes by their union. The lower jaw is somewhat sharp and broadly pointed. The teeth are small and villiform; those of the jaws form narrow bands which may be interrupted in the middle; those on the palate form two oblong and somewhat curved patches which may be continuous. The teeth on the upper jaw are in advance of the lower jaw. The nostrils are situated wide apart; the anterior nostrils are rounded, slightly tubular and directed forwards; the posterior nostrils are considerably larger, more approximated and situated on the top of the head. There are eight barbels; one pair nasal, which extend beyond the anterior margin of the eye; one pair maxillary which are somewhat longer than the head and two pairs mandibulars which are close together at a short distance behind the tip of the lower jaw and are considerably shorter than the head. The maxillary barbels are situated in grooves which run below the eyes. The gill-openings are wide, but only the portion above the base of the pectoral fin is provided with a broad membrane and it seems probable that this portion is mostly used during respiration, as has been observed in the case of other hill-stream fishes.

The rayed dorsal is situated above the pectorals and is almost entirely in advance of the ventrals. Its spine and the anterior branched rays are considerably longer than the posterior ones. The dorsal spine is rather feeble, smooth anteriorly and finely serrated posteriorly. The adipose fin is small, but distinctly

marked; it is situated about the beginning of the last third of the distance between the commencement of the rayed dorsal and the base of the caudal fin. The anal fin is long with about half-a-dozen



Text-fig. 8.—Upper dentition of two specimens of *Clupisoma montana*, sp. nov. $\times 4$.

anterior rays somewhat longer than the others; its base is about one-third the length without the caudal and terminates at a considerable distance from the caudal fin. The pectoral fin is long and pointed; its spine is somewhat stronger than that of the dorsal and is smooth externally and finely serrated internally; it extends beyond the commencement of the ventral. The ventrals just reach the anal opening. The caudal is deeply forked.

The depth of the body is contained from 4.5 to 4.8 times in the length without the caudal and the least height of the caudal peduncle 1.8 times in its length.

In the spirit specimens the head is dull white while the back is gray which fades on the sides. The lower portion is olivaceous. The eyes are grayish in colour.

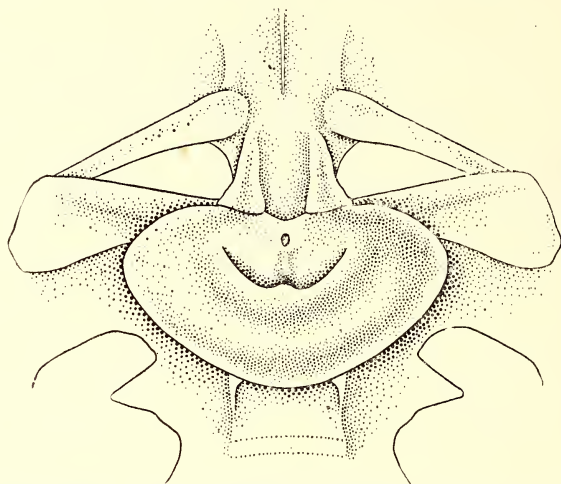
The air-bladder is transversely ovate and greatly flattened; its anterior portion is almost solid and the posterior part is bent in the form of a semicircular canal suggesting an approach to the structure found in *Eutropiichthys* and *Ailia*. Owing to the paucity of specimens I have not been able to investigate this structure more fully.

Locality: Teesta River, below Darjeeling.

Type-specimen: F 12472/1, Zoological Survey of India, Indian Museum, Calcutta.

Remarks: *Clupisoma montana* can be readily distinguished from *C. garua* by the (i), relative shortness of its barbels (ii), relative

weakness of its dorsal and pectoral spines (iii), presence of adipose dorsal in the adult (iv), upper dentition (v), larger number of rays in the anal fin and (vi), structure of the air-bladder.



Text-fig. 9.—Air-bladder and associated skeletal elements of *Clupisoma montana*, sp. nov. $\times 4$.

In characters ii, v and vi the new species is more highly specialised whereas in the other three characters it is more primitive. It seems probable that the two species have evolved from a common generalised form, one taking to life in mountainous streams while other entered sluggish waters. The ecological differences in their habitats probably led to the production of two species. The generalised form is probably represented at the present day by *Clupisoma prateri*, sp. nov.

Measurements in millimetres.

Total length without caudal	...	...	237.0	241.0
Length of head	...	...	47.5	48.2
Depth of body	...	...	48.5	53.2
Width of head	...	...	36.0	30.0
Height of head at occiput	...	...	37.5	36.6
Length of snout	...	...	18.0	19.0
Diameter of eye	...	...	10.0	10.0
Interorbital width	...	...	20.0	20.0
Length of caudal peduncle	...	...	37.0	39.0
Least height of caudal peduncle	...	...	20.2	20.0
Longest ray of dorsal	...	...	39.0	45.0
Longest ray of anal	...	...	29.0	31.0
Length of pectoral	...	...	40.0	43.0
Length of ventra	...	...	26.0	25.0
Length of nasal barbel	...	...	17.0	14.0
Length of maxillary barbel	...	...	52.0	56.0
Length of outer mandibular barbel	...	...	25.0	22.0
Length of inner mandibular barbel	...	...	36.0	28.0
Length of base of anal fin.....	...	...	75.0	80.0

ACKNOWLEDGMENTS.

The Bombay Natural History Society very kindly made a grant towards the cost of the illustrations and for this I offer my sincere thanks to the authorities of the Society. Mr. K. S. Misra, M.Sc., my assistant in the Zoological Survey of India, has helped me in the preparation of the tables of measurements and for this I am very grateful to him. The illustrations were prepared by Babu B. Bagchi with his usual skill and care under my supervision.

LIST OF REFERENCES.

1. Bleeker, P.—'Nalezingen op de ichthyologische fauna van Bengalen en Hindostan'. *Verh. Bat. Gen.*, vol. xxv, p. 110 (1853).
2. Bleeker, P.—*Ichthyologicae Archipelagi Indici Prodomus.*, vol. i, Siluri, p. 255 (Batavia, 1858).
3. Bleeker, P.—'Notice sur les genres *Parasilurus*, *Eutropiichthys*, *Pseudeutropius* et *Pseudopangasius*'. *Versl. Akad. Amsterdam*, vol. xiv, p. 393 (1862).
4. Blyth, E.—'Report of Curator, Zoological Department, for May 1858'. *Proc. As. Soc. Bengal*, vol. xxvii, p. 283 (1858).
5. Bridge, T. W. and Haddon, A. C.—'Contributions to the Anatomy of Fishes.—II. The Air-bladder and Weberian Ossicles in the Siluroid Fishes'. *Phil. Trans. Roy. Soc. London* (B), vol. clxxxiv, pp. 212, 213 (1894).
6. Cuvier, M. and Valenciennes, M. A.—*Histoire naturelle des Poissons*, vol. xiv, p. 379 (1839).
7. Day, F.—'On the Fishes of Orissa'. *Proc. Zool. Soc. London*, p. 307 (1869).
8. Day, F.—'On the Freshwater Siluroids of India and Burma'. *Proc. Zool. Soc. London*, p. 709 (1871).
9. Day, F.—'The Fish and Fisheries of Bengal'. In Hunter's *A Statistical Account of Bengal*, vol. xx (London, 1877).
10. Day, F.—*Fishes of India* (London, 1876-8).
11. Fowler, H. W.—'Zoological Results of the Third De Schauensee Siamese Expedition. Part viii,—Fishes obtained in 1936'. *Proc. Acad. Nat. Sci. Philadelphia*, vol. lxxxix, p. 142, fig. 32 (1937).
12. Günther, A.—*Catalogue of the Fishes in the British Museum*, vol. v, p. 56 (London, 1864).
13. Hamilton, F.—*An Account of the Fishes found in the River Ganges and its branches*, pp. 186, 187 (Edinburgh, 1822).
14. Hora, S. L.—'Fish and Fisheries of Manipur with some observations on those of the Naga Hills'. *Rec. Ind. Mus.*, vol. xxii, pp. 188, 189, fig. 3 (1921).
15. Hora, S. L.—'Siluroid Fishes of India, Burma and Ceylon. IV. On the use of the generic name *Wallago* Bleeker'. *Rec. Ind. Mus.*, vol. xxxviii, pp. 207, 208 (1936).
16. Hora, S. L.—'Siluroid Fishes of India, Burma and Ceylon. Fishes of the genus *Heteropneustes* Müller'. *Rec. Ind. Mus.*, vol. xxxviii, pp. 208, 209 (1936).
17. Hora, S. L.—'Siluroid Fishes of India, Burma and Ceylon. VII. Fishes of the genus *Silurus* Linnaeus'. *Rec. Ind. Mus.*, vol. xxxviii, pp. 351-6 (1936).
18. Hora, S. L.—'Siluroid Fishes of India, Burma and Ceylon. VIII. Fishes of the Genus *Cellichrous* Hamilton'. *Rec. Ind. Mus.*, vol. xxxviii, pp. 356-61 (1936).
19. Hora, S. L.—'Geographical Distribution of Indian Freshwater Fishes and its bearing on the probable land connections between India and the adjacent Countries'. *Curr. Sci.* vol. v, pp. 351-6 (1937).
20. Hora, S. L.—'The Game Fishes of India. I. "The Indian Trout" *Barilius* (*Opsarius*) *bola* Hamilton'. *Journ. Bom. Nat. Hist. Soc.*, vol. xxxix, pp. 199-210 (1937).
21. Hora, S. L.—'The Game Fishes of India. II. "The Bachhwa or Butchwa". *Eutropiichthys vacha* Hamilton'. *Journ. Bom. Nat. Hist. Soc.*, vol. xxxix, pp. 431-446 (1937).

22. Swainson, W.—*On the Natural History and Classification of Fishes, Amphibians and Reptiles*, vol. ii, p. 306 (1839).

23. Vinciguerra, D.—'Appunti Ittiologici sulle collezioni del Museo Civico di Genova. VI. Enumerazione di alcuni pesci raccolti alle foci del Gange e dell' Irrawaddi dal capitano Gerolamo Ansaldo'. *Ann. Mus. Civ. Stor. Nat. Genova* (2), ii, p. 91 (1885).

24. Vinciguerra, D.—'Viaggio di Leonardo Fea in Birmania e regioni vicine. Pesci'. *Ann. Mus. Civ. Stor. Nat. Genova* (2), xix, pp. 209-11 (1890).

EXPLANATION OF PLATE.

Lateral view of a specimen of *Clupisoma garua* (Ham.) from the Settling Tanks of the Calcutta Corporation Water-works at Pulta. $\times ca. \frac{1}{2}$.

The three illustrations show the changes in colouration which a specimen undergoes after its removal from water.

Top. Immediately after removal from water.

Middle. One hour after removal from water.

Bottom. Two hours after removal from water.